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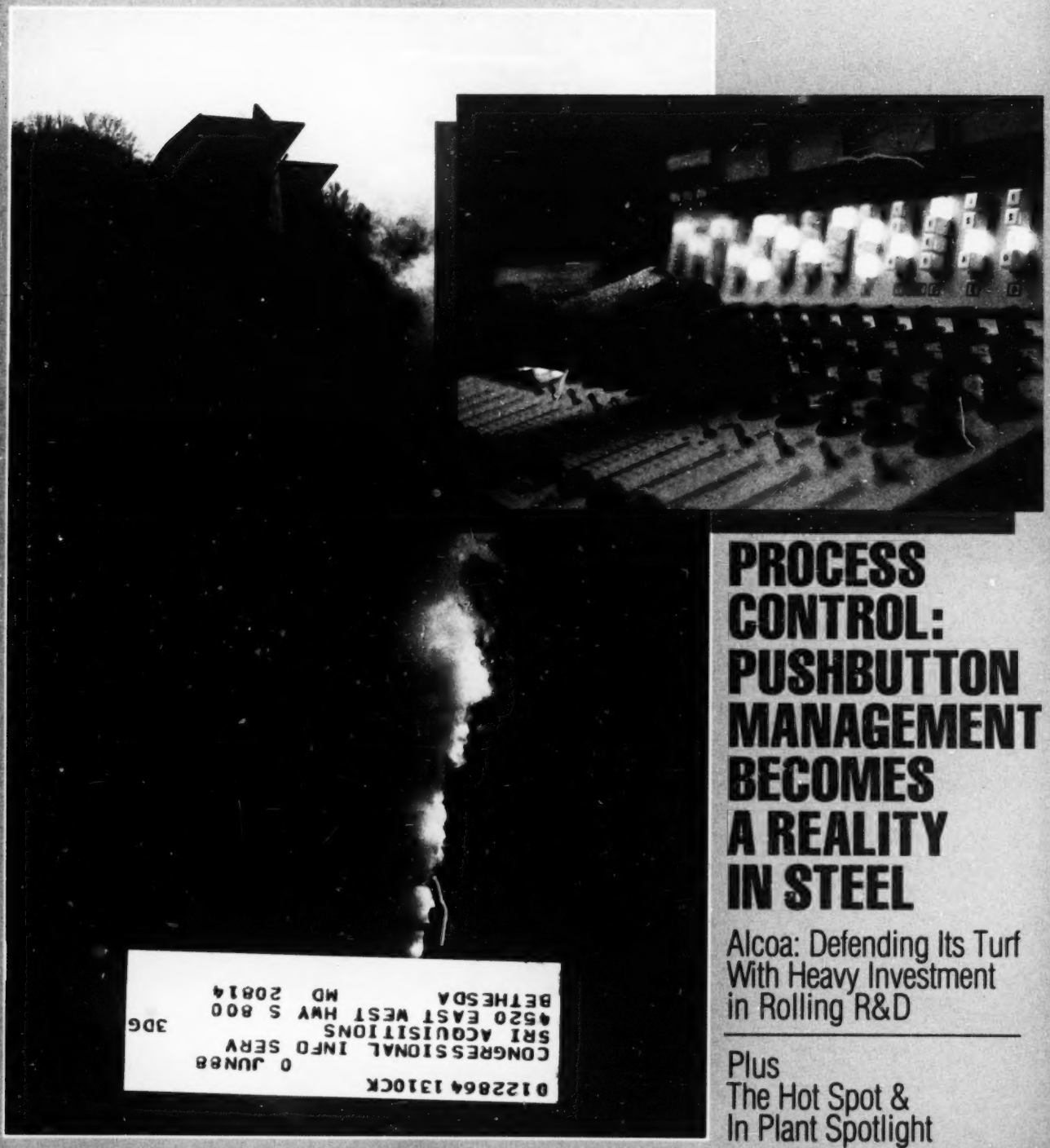

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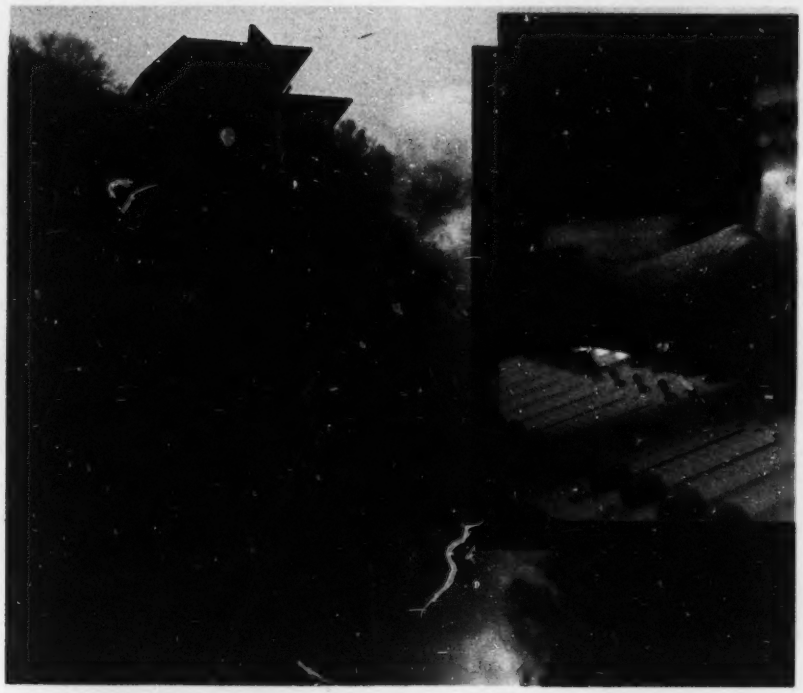
PROCESS CONTROL: PUSHBUTTON MANAGEMENT BECOMES A REALITY IN STEEL

Alcoa: Defending Its Turf With Heavy Investment in Rolling R&D

Plus
The Hot Spot &
In Plant Spotlight

DECEMBER 3, 1984, VOL. 227, NO. 23

IRON AGE METALS PRODUCER



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THE PUSHBUTTON AGE ARRIVES IN STEEL

What's new is the progress of steel companies in providing the hardware and software for fully computerized management.

BY GEORGE MCMANUS

When they look at process control, steel producers are starting to take in all the steps that go into selling, making and delivering material.

The whole sequence, with all support activities, is being integrated and optimized in computer networks.

"Our company-wide system is being developed for sales, optimum distribution methods, production planning and control, and cost and profitability verifications," said Shoichi Ide, managing director, Nippon Kokan (NKK).

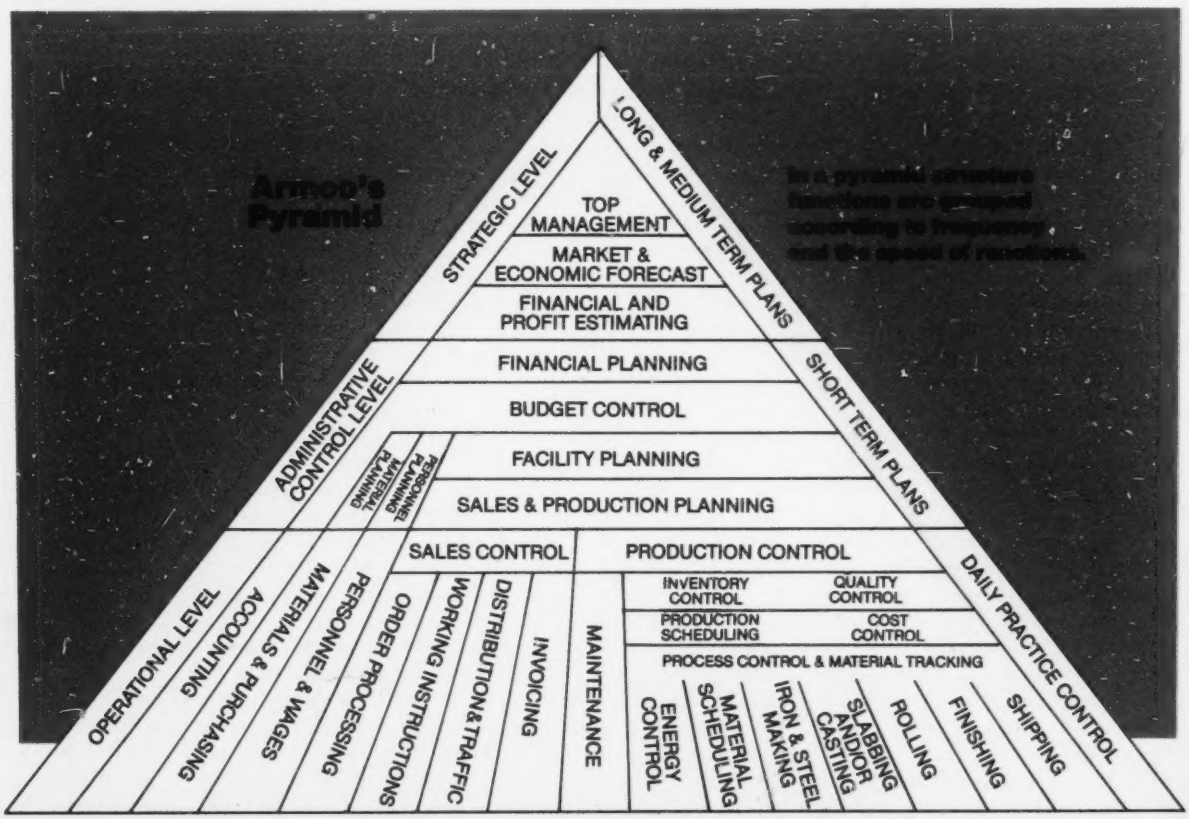
"Management systems are, or should be, coordinated, integrated systems," said Robert E. Boni, president of Armco Inc.

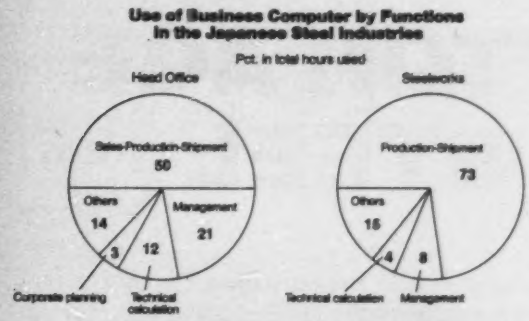
Information may be collected for a variety of purposes, Mr. Boni indicated, but the groups of facts should not be isolated.

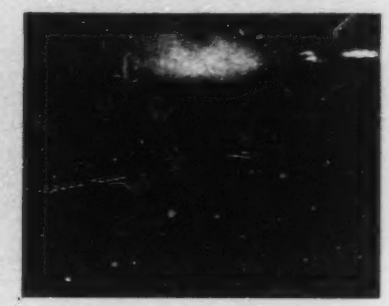
"These data should be reconcilable with one another," he said. "In a sense, a management control system is a single system, but it is more accurate to consider it a set of subsystems."

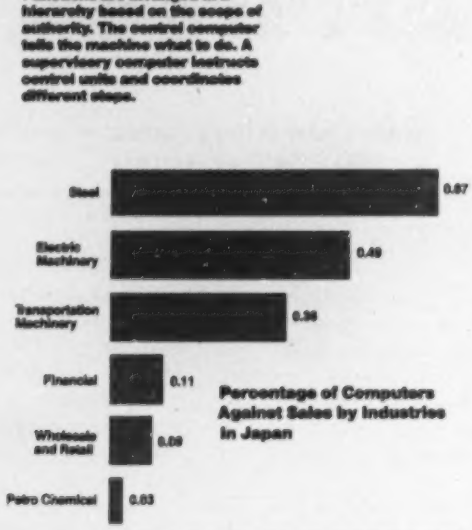
These comments were part of a panel discussion on information systems at the October meeting of the International Iron & Steel Institute (IISI). The word, information, is a little misleading; what was discussed was computerized management of entire companies.

This theme is not brand new. Twenty years ago, people were talking about total systems and pushbutton plants. Operations research people have long argued that the








In relation to sales, Japan's steel companies are spending twice as much on computers as the country's petrochemical companies.
In Japan and elsewhere, computer networks follow traditional organizational lines. Functions are arranged in a hierarchy based on the scope of authority. The control computer tells the machine what to do. A supervisory computer instructs control units and coordinates different steps.
Steel
0.67
Electric Machinery
0.49
Transportation Machinery
0.36
Financial
0.11
Wholesale and Retail
0.09
Petro Chemical
0.03
Percentage of Computers Against Sales by Industries in Japan

easiest job to program is the chief executive's.

What's new is the progress of steel companies in providing the hardware and the software for fully computerized management. It's of interest that basic steel with its stodgy image is leading the way in this area.

"Our steel industry puts computers to work much more than do other Japanese industries," said Mr. Ide of NKK.

In relation to sales, Japan's steel companies are spending twice as much on computers as the country's petrochemical companies.

In Japan and elsewhere, computer networks follow traditional organizational lines. Functions are arranged in a hierarchy based on the scope of authority. The control computer tells a machine what to do. A supervisory computer instructs control units and coordinates different steps. At the top of the pyramid is a computer which synchronizes the whole plant and interfaces with the corporate business system.

Pyramid

A somewhat different way of looking at the control structure is a pyramid based largely on timing. Functions are grouped according to frequency and the speed of reactions. Order entry is placed at the same level as machine control; both occur daily and call for fast decisions.

Above the operational level are administrative functions. Mr. Boni places various short-term managerial steps at this level. Financial planning, sales planning and budget control are in Mr. Boni's administrative bracket.

Evaluation and analysis are considered administrative functions by Sybren Kramer, assistant director in charge of automation of information systems, Hoogovens Groep BV.

At the top of the time-based pyramid is the strategy level. Long term and medium term decisions are made at this point, said Mr. Boni.

"This level," he said, "is the process of deciding on objectives of the organization, on changes in these objectives, on the resources used to attain these objectives, and on the policies that govern the acquisition, use and disposition of these resources."

In both the authoritative and time-based concepts, there is an ascending order of control and management. There are those who wonder if this hierarchy is appropriate.

"The computer will smash the pyramid," wrote John Naisbitt in the book, *Megatrends*. "We created the hierarchial, pyramidal management system because we need it to keep track of people and things people did. With the computer to keep track, we can restructure our institutions horizontally."

This passage was cited by William F. Monteith, corporate director, information resources management, Armco Inc. "I agree with Naisbitt that the organization will change," said Mr. Monteith.

There may well be changes, but at the moment, it is a monumental task to duplicate the existing organization with computers. The diagram of the computer network at NKK's Keihin Works gives some idea of the size and complexity of a steel plant control system.

Taking in the new Ohgishima complex, the system employs distributed process control with centralized information handling.

"The network consists of the cen-

The operational level is the lowest level of process control. Pictured is Leeds and Northrup's process control unit at U.S. Steel's continuous caster at its Lorain Works.

tral computer and local computers at individual mills and processes," said Mr. Ide of NKK. "An order entry arrives at the central computer from the Tokyo head office computer and is processed to include such additional elements as production, inspection, and shipment data. The Keihin control computer then sends appropriate instructions to the local mill computers..."

Status reports, operating conditions and inspection data are automatically logged throughout the process. Inspection certificates and invoices are automatically prepared.

The computer system has helped to reduce employment at Keihin Works from 18,000 in 1969 to 8,000 in 1984. Labor productivity has increased two to four times. Yield has been improved by as much as 5 pct.

This general format is being followed in steel plant systems throughout the world. At the Fairfield, Ala., pipe mill of United States Steel Corp., there is provision for four or five levels of control. The direct controls are at the lowest level. One step up are mini-computers that correspond to area foremen. Next, there is the divisional computer which takes in the whole pipe mill. On top of this is a computer which is wired into the entire plant.

There is then the link with the business computer. This takes in orders, sets production schedules, tracks orders and analyses quality.

At NKK's Keihin Works, the plant computer is connected to the headquarters computer system. The headquarters computer gives price and delivery information in response to inquiries. When orders are placed, the computer selects the appropriate plant—Keihin or Fukuyama—and forwards production instructions.

Adminstration

The head office computer also handles a variety of administrative tasks. Market projections, distribution studies, and different production analyses are part of the administrative function.

"All sales and administrative departments have access to the data base...." said Mr. Ide.

He saw a need to expand the role of the computer in the administrative field. "While production controls are well computerized at NKK, the primary targets from here on are more effective uses of computers in that important field of administrative control and strategy—the expansion to improve the field of management methods."

Mr. Kramer of Hoogovens agreed that the use of computers has lagged at the administrative level. "This is especially the case for evaluation and analysis where the information requirements seem to be constantly changing," he said.

"...decisions at the administrative control level are still based more on intuition and experience than on information derived from computer systems."

A wide variety of information must be available for administrative functions and human judgment figures importantly in evaluations. The difficulty is that linking qualified humans with the necessary data has been a cumbersome process.

This difficulty was reduced as more powerful computers and more flexible languages were developed in the Sixties. "The number of analyses grew gradually to a couple of hundred per year and over a hundred routine reports emerged," said Mr. Kramer of the Hoogovens program. "However, to solve a problem, the user still had to go through an intermediate programmer and selecting the required data from numerous tape files was very time consuming."

The result was a cost of $1,000 per analysis and two or three months time for a complicated study.

The time spans and the costs were reduced with further computer advances, but a satisfactory technology didn't arrive until what Mr. Kramer called the Fourth Generation computers.

"The fourth generation," he said, "is characterized by: very powerful query facilities which are easy to learn for users...; new data base management facilities which can handle the historical data and provide easy access to the data."

The new computers have what is called a 'relational data base'. This makes it possible for a manager to grope for information. The data is stored in such a way that there is no need to pre-define access paths," explained Mr. Kramer.

This characteristic can be employed by managers for trouble shooting, process control, quality control and investment evaluation. "They might ask what orders have been delivered to a specific customer and find out all the technical information on the material shipped...," said Mr. Kramer.

He looks for major advances in the administrative area. "Within a few years, end user computing might be a predominant growth factor in data processing," he said, "for in almost all functional areas, the requirement for new information sys-

U.S. Steel Using Cameras at Homestead

A camera positioning system has been installed at the Homestead Works of United States Steel Corp.

Supplied by Compunetics, Inc., of Pittsburgh, the system serves the 52-inch bloom and structural mill at Homestead. It replaces a mechanical vernier gauge in getting slabs properly positioned for cropping.

To get the right positioning, the operator watches a cathode ray tube. This displays the length of the slab as measured from the shear knife. Two cameras are required to provide the necessary accuracy and still cover the entire range of product lengths.

Field tests of the installed Compunetics unit were conducted to check the system's accuracy and reproducibility. These tests involved: 1. Cutting slabs to 15 to 23 foot lengths using the CRT display; 2. lifting the hot cut sections off the roller table, setting them aside, and allowing them to cool; 3. measuring the cold lengths of the cut sections; 4. using thermal expansion equations and measured temperatures to back-calculate to the hot length of the cut sections; 5. comparing the back-calculated hot lengths to those displayed by the camera system.

The comparisons of hot and cold lengths were complicated by the fact that all the cold sections were bowed and warped due to the hot lifting operation and nonuniform cool-down. Allowing for this distortion, Compunetics reported, the system functioned with precision and consistency.

The company has developed a variety of noncontact measurement systems. These use CCD line scan cameras and Compunetics processors for pattern analysis and recognition.

The Test Results of the Compunetics Slab Positioning System Installed at the Bloom and Structural Mill at U.S. Steel's Homestead Works

		Length (inches)			
Slab No.	Cut No.	Specified by Camera System	Measured Cold	Uncertainty in Cold Measurement	Back-Calculated Hot Length
1	1	180.0	177.1	+1.0/−0.0	179.6 – 180.7
	2	180.0	176.8		179.3 – 180.4
	3	180.0	176.8		179.3 – 180.4
2	1	276.0	270.8	+1.5/−0.0	274.6 – 276.2
	2	276.0	270.6		274.5 – 276.0

tems at the administrative control level exists."

Strategy

"The abundance of information available upon which to base strategic decisions is often overwhelming," said Mr. Monteith of Armco. "And yet as we all know, the more relevant information we have, the better our decision."

As in the administrative area, computer advances have facilitated the task of providing the right information for strategic management. Vast quantities of data can now be manipulated at a nominal cost.

"In just the past decade, processing technology has enabled a per unit performance improvement of approximately 1 million to 1," said Mr. Monteith.

He noted that today's computers not only provide ready access to internal data but make it possible to tap external sources for government statistics and private accumulations.

"Furthermore," said Mr. Monteith, "economic forecasting has been improved by the increasing availability of data."

After the disappointments of the last three years, steel producers may question any suggestion that market forecasting has become an exact science.

The difficulty of forecasting showed up in the failure of Armco's diversification strategy. After correctly assuming that the steel industry would return low profits, Armco diversified into financial services and energy. In both fields, the company suffered sharp reverses.

"Diversification doesn't help when everything goes bad at once," said Harry Holiday, chairman of Armco. With all the computers and information, no one has found a foolproof way of predicting when everything will go bad.

There are other areas where the values can't be quantified with any precision. Mr. Monteith cites some of the questions top management must answer.

"What does the customer want and how best can we serve him? Where do our obligations lie with respect to social conscience? What moral responsibilities do we have to the workforce and to welfare?"

The computer may not be able to give direct answers to these questions but it can provide indirect guidance. The computer can tell the chief executive how much it's costing to give the customer just-in-time delivery. It can measure the cost of discharging social obligations.

This information won't answer key questions but it will provide a basis for answers. The computer can't tell an executive how much the good will of a customer is worth, but it can give the inventory cost of maintaining good relations.

For the right kind of information to be available, Mr. Monteith indicated, top management must take part in defining strategic objectives. In accounting, inventory control, and other more traditional computer applications, the needs are obvious and the tasks repetitious. The strategy is more complex. □

ALCOA DEFENDS ITS HOME TURF

The company is spending heavily to beef up its flat rolled products division to maintain its position in rigid container sheet.

BY ROBERT REGAN

The bigger the turf, the larger the effort and expense needed to defend and enlarge it as market conditions permit. That's how it is with Aluminum Co. of America, which is spending heavily to beef up its flat-rolled products division, technologically and capacity-wise, to bolster its position in rigid container sheet (RCS) and other rolled products.

Alcoa executives stress that the program, which carries a price tag of about $1 billion if recent modernization moves are counted, is quality-driven. But they won't deny that there will be a quantity dividend, perhaps up to 20 pct. Alcoa chairman Charles M. Parry has called it "the most extensive and expensive flat rolled products modernization program in our 100-year history."

Centerpieces are the Alcoa, Tenn. mill, which makes mainly RCS and common alloy sheet, and Warrick, Ind., which is dedicated to RCS. Sizable modernization work already has been done at the Davenport, Iowa mill, which covers all flat-rolled products, and Lebanon, Pa. where lighter gage items are rolled, but further improvements are in the works at both.

Some observers see the program as a gamble in view of pressures from RCS expansions by competitors, imports and other materials. Alcoa calls it a must because customers are in a position to demand the highest quality, which is their ticket to higher profitability because it permits higher production speeds and reduces losses from downtime. Ability to deliver consistent quality will be even more important as the gage of RCS continues to narrow.

One of the biggest concerns to Alcoa and other domestic RCS was the ability of Japanese rivals to deliver consistently high quality RCS here at competitive prices. Low ingot prices helped, as did traditional Japanese talents with scrap supplies, but this wasn't the whole story. Alcoa credits as well the technique of Statistical Process Control (SPC) which the Japanese were quick to adopt and which Alcoa now uses at 12 plants and intends to make system-wide were also helpful. "With SPC," said Sandy Nelson division general manager, manufacturing, "we will track the history of each piece of metal, monitoring the gage, surface quality, temper, etc., continuously. If something is about to go wrong, we want to know what and why before it happens. Our responsibility no longer ends at the loading dock; it runs inside the customer's plant. In the case of RCS, it ends only after the customer makes a can of it, fills it with beverage and puts a lid on it."

What's at stake for Alcoa? Its sales of flat rolled products in 1983 brought in $2.3 billion, 43.6 pct of total revenues. Packaging and container market sales were $1.5 bil-

Aluminum industry shipments of flat-rolled products vs other aluminum products

Millions of lbs

	Sheet	Plate	Foil	Others*
1983	6,587	214	865	6,893
1982	5,471	216	751	6,078
1981	5,900	283	864	6,767
1980	6,660	317	840	7,594
1979	6,302	311	906	7,949
1978	6,500	[illegible]	[illegible]	[illegible]
1977	5,929	236	816	6,005
1976	5,502	217	784	5,622
1975	3,902	256	817	5,154
1974	5,357	324	762	7,287

*Includes forgings, extruded shapes, pipe and tube, drawn and welded tube, rod and bar, fasteners, etc.

lion, 28.4 pct of total revenues and 65.1 pct of flat-rolled product sales.

Industry shipments of RCS hit 3.34 billion lbs last year, 21.6 pct of total shipments and 47.7 pct of sheet shipments. In 1974, RCS accounted for 1.54 billion lbs, 11.2 pct of total shipments and 28.7 pct of sheet shipments. The period saw aluminum claim virtually all the beer can market and 87 pct of soft drink cans. With little room left for growth vs the steel can, the aluminum companies are combatting glass beverage containers and hoping for real penetration in the food can business.

RCS Capacity

Meanwhile, there are some problems, including the possibility that RCS capacity may be expanding too fast, in the near term at least. Cases in point are the new and expandable Logan County, Ky. mill to be managed jointly by Alcan Aluminum Corp., and Arco; a new can stock plant planned by Alumax, Inc.; recent modernizations by Reynolds Metals Co. and Kaiser Aluminum & Chemical Corp.—and the capacity dividend from Alcoa's program.

The Japanese can't be expected to just go away when ingot is an attractively-priced plentiful commodity, although the U.S. companies are hoping the Japanese will pursue traditional markets on their own side of the Pacific Rim.

Nor do the aluminum companies lightly dismiss the potential rivalry of the plastic soda cans, which Coca-Cola plans to test market in the U.S. and Canada in 1985 using containers made by Petainer Development Co., a joint venture of Metal Box P.L.C. of the U.K., Sweden's Aktiebolag and Dorsey Corp. of Chattanooga, Tenn. Another firm, Thermoforming U.S.A. of Columbus, Ohio, said it has a nearly-perfected entry under study by the soft drink companies.

Ron Hoffman, Alcoa group vice president, admits the plastic container is a threat, though probably over the longer term because "they have to do more work on recycling—or disposal—before they can blow us away." Thomas J. Tayler, division general sales manager, said it was "worrisome, very worrisome—which is to say we don't take it lightly. They aren't there yet, technologically, but I have to believe with all those chemical companies with money to spend, and with a fine marketer like Coke, they are going to surmount some of the obstacles. Still, there is the recycling matter and even the Petainer people will tell you that the Achilles heel of the thing is disposal. You can't compare the value of an empty aluminum can and an empty plastic can. What we've got to do is get our recycling rate up from 55 pct to 75 pct and that's what we are doing."

Mr. Hoffman said recycling "is a big advantage, a tight hook." As for the debut of the Logan mill, he said "anytime you bring on new capacity, there's some cramping (but) a lot depends on how they eventually size it and how quick they can become commercial." Asked if Alcoa was daunted by the plastic can, rising RCS capacity and imports, he said "what we are saying is that the risk is manageable enough to justify spending the money." The key, he said, is to be able to deliver consistent quality in narrower and narrower gages to maintain marketshare and advance as some of the opposition falls behind.

Wider Sheet Trend

The trend in RCS goes toward wider sheet, from which more blanks are punched, lightweighting, bigger coils, higher surface and metallurgical quality and flexibility in coatings. The gage in body stock is down to 0.013 in. from 0.016-in. 10 years ago and Alcoa is aiming for 0.010 in. by 1990. Can companies once content with coils wide enough to punch out five blanks now want coils for 12-outs and 14-outs. Much of the new gear at Alcoa, Tenn. and Warrick is designed to meet these requirements.

Planned for Alcoa, Tenn. is a "continuous-continuous" multistand cold mill that needn't stop to load coil. Looping the feedstock high at the business end provides enough time to join coil ends before the rollers draw the loop down. The mill will be able to handle 96-in. OD wide coil for RCS and will have expanded gage, surface, flatness and metal property controls. It is due onstream in 1987, one year after modernization of a hotline which includes more hp, widening to handle 80 in. sheet and addition of hydraulic gap control with roll eccentricity compensation for monitoring backup rolls for imperfections which could hamper operation. There also will be a new single stand cold mill for 80 in. coils, homogenizing furnaces and annealing furnaces.

Warrick, which turns out 500,000 metric tons of RCS a year, will be converted to EMC in 1986-89. Its hotline will be widened to handle sheet widths to 65 in. and quality improved. The No. 2 five-stand cold mill will be handling 64-in. widths by 1986 and the No. 4 six-stand (world's largest) cold mill also will be widened to 64-in. sheet. Warrick also is getting finishing capabilities for coating, levelling and slitting, including more width capability and an electro-coating process for more uniform coatings.

Davenport is slated for a $120 million modernization close on the heels of $120 million improvement which includes an 84-in. continuous finishing line, the cold mill, no-controlled saw/router combo, a microcomputer-controlled stretcher and a scalper able to work both surfaces simultaneously. The hotline is to be upgraded for higher quality and the No. 2 and No. 4 cold mills will be upgraded and widened, while the ingot unit will be capable of producing larger ingots of 96-in. coil capability.

Alcoa's program is designed to provide two or more mills able to make any product, protecting against shutdown problems. "Secondly," said Mr. Hoffman, "we'll have greater capacity and this will help us meet current and future customer needs in all phases of our business. Thirdly, and most importantly, we will have the equipment we need, combined with SPC-oriented people, to produce consistent quality throughout the system." □

NOTE

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